REMARKS/ARGUMENTS

Claims 1-90 are pending in the application. Claims 1-90 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Applicant respectfully traverses this rejection.

Applicant points out that Claims 27-50 and 70-90 are apparatus claims, and recite a neural network architecture. Applicant therefore believes that the Examiner's comments in paragraphs 2-14 of the Office Action regarding the patentability of business methods under *State Street* and *Warmerdam* to be inapplicable *per se* to these claims. Nonetheless, independent claims 27 and 70 have been amended to recite a data processing apparatus in order to expedite prosecution and clarify that the claims are limited to practical applications in the technological arts.

With respect to claims 1-26 and 51-69, which recite methods for computation using a neural network architecture, independent claims 1 and 51 have been amended to clarify the practical application in the technological arts of the claimed methods. In particular, claim 1 has been amended to recite that data to be processed by the neural network is received by the input layer and processed by the processing layer of the neural network. Claim 51 has been amended to recite that data to be processed is received by the input and computation is performed upon the data using a minimalization step. Such processing and computation steps clearly meet the requirement for practical application within the technological arts.

Moreover, the claims have been further amended to clearly recite a useful, concrete and tangible result under *State Street* as well as post-processing activity under *Warmerdam*. In particular, claim 1 has been amended to recite outputting processed data from the output channel

and claim 51 has been amended to recite the step of using at least one output to output processed data.

Furthermore, the claims are directed to apparatuses and methods for implicit digital computation, which is clearly a practical application within the technological arts. Applicant's specification at Paragraph [0003] states:

> The invention relates in general to the field of neural networks, and more particularly, to implicit general computation by means of digital applications or by means of dynamic systems with underlying fractal attractors.

Applicant's specification at Paragraph [0011] sets forth examples of the practical application of implicit computation:

> Implicit versions of simulated annealing are possible, for example, Alspector, U.S. Pat. No. 4,874,963, implements the Boltzmann distribution with semi-conductor circuits, and uses a source of noise to adjust the "temperature" parameter.

Finally, Paragraph [0013] sets forth practical applications of neural networks:

> While neural network designs requiring explicit computation are very common, implicit designs, such as Alspector's cited above, are rare. Cooper, U.S. Pat. No. 6,009,418, to which this application claims priority, is a clear example of this kind of design. It discloses an architecture that permits self-adjusting channels which already provides at least 26 percent improvement in digital simulations over other designs on deeply-nested dependency problems. It also incorporates learning rules based on non-stationary processes that permit non-digital implementations through dynamic systems characterized by

> such non-stationary processes, such as systems described by Bose-Einstein statistics. Finally, it discloses a network design that can exploit the capability of fractal sets to encode and process information.

In view of the amendments to independent claims 1, 27, 51 and 70, and the arguments set forth above, Applicant respectfully asserts that the rejection of claims 1-90 under 35 U.S.C. § 101 is moot and should be withdrawn. For these same reasons, the associated rejection of claims 1-90 under § 112, first paragraph, is now moot and should be withdrawn.

Claims 1-5 and 27-31 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Lo. This rejection is respectfully traversed in view of the following remarks. Lo discloses a method and apparatus for signal filtering using recurrent neural networks. Lo states at column 1, lines 12-15, that:

> This invention is concerned with the problem of discrete-time optimal filtering, namely the problem of processing a discrete-time measurement process for the purpose of estimating a discrete-time signal process.

As is clear from the above, Lo is directed to a particular application as opposed to the claimed neural network architecture (and methods of using same) for implicit digital processing. Lo particularly fails to teach or suggest Applicant's recited step of using re-entrant feedback from the output channel to perform minimalization for *general computation* as set forth in claim 1, or the means for using re-entrant feedback from the output channel means to perform minimalization for *general computation* as set forth in claim 27.

Moreover, Lo discloses an application that makes *explicit* computations, and fails to teach or suggest a data processing apparatus or method for <u>implicit</u> digital computation as recited in each of applicant's independent claims. The contrast between implicit and explicit computation

is explained, e.g., at paragraphs [0007] through [0008] of Applicant's present specification. Indeed, Lo is completely outside the class of fractal computers to which the present invention is directed.

Lo fails to teach or suggest Applicant's claimed step of using a plurality of layers, each layer including a plurality of computational nodes for implicit computation, as set forth in claim 1. Lo fails to teach or suggest Applicant's claimed processing layer means for implicit computation as recited in claim 27. Lo fails to teach or suggest Applicant's claimed minimalization step for performing implicit computation as recited in claim 51. Finally, Lo fails to teach or suggest Applicant's claimed neural network architecture using a minimalization step for implicit computation as recited in claim 70.

The Examiner reads Applicant's claimed layers on those disclosed in FIG. 6 of Lo. Applicant disagrees. As set forth in Lo's specification at column 5, lines 57-58, FIG. 6 of Lo is a schematic diagram of a typical multilayer perceptron with output feedbacks. It will be recognized by persons skilled in the art that a perceptron requires explicit, not implicit, computations.

Furthermore, Lo fails to teach or suggest applicant's claimed step of using local update processes to update each of the plurality of computational nodes, as recited in claim 1, and fails to teach or suggest the claimed means for updating each of the plurality of adaptive computational node means using local update processes as recited in claim 27. While Lo uses the word "update," he does so to describe an iterated application of measurements using the estimated value for x(t+1) and the predicted value x(t+2). See, e.g., Lo at column 2, lines 3-18. This is far removed from, and fails to teach or suggest, Applicant's local update process, as described and claimed in the instant application.

Lo further fails to teach or suggest the claimed step of using re-entrant feedback from the output channel to perform minimalization as recited in claim 1, fails to teach or suggest the claimed means for using re-entrant feedback from the output channel means to perform minimalization as recited in claim 27, fails to teach or suggest the step of using a minimalization step for performing implicit computation as recited in claim 51, and fails to teach or suggest a neural network architecture wherein a minimalization step is used for implicit computation as recited in claim 70. The Examiner cites Lo at Figure 6, element 26, regarding minimalization. However, in Lo, the feedback data in element 26 is a set of activation functions. These are part of the global calculations --not the local ones needed for implicit computation-- and they are the same as the other calculations at the perceptron nodes with respect to input weights and adjustment of the resulting activation function. The purposes and functions are very different. Adjustments to weights in perceptrons are made at a global level, that is, for the entire network at once. As will be recognized by those of ordinary skill in the art, implicit computation requires calculations or adjustments to be made at a local level, without recourse to information elsewhere in the network or from parameters provided from the outside.

Thus, independent claims 1, 27, 51 and 70 positively recite elements which are neither taught nor suggested by as set forth above. Dependent claims 2-26, 28-50, 52-69 and 71-90 inherit the limitations of their respective base claims, and are likewise distinguished from Lo for at least these same reasons. The Court of Appeals for the Federal Circuit has consistently held that "Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim." Lindemann Maschinenfabirk Gmbh v. American Hoist & Derrick, 221 USPQ 481, 485 (Fed. Cir. 1984). Withdrawal of the rejection of claims 1-90 as being anticipated under 35 U.S.C. § 102(b) over Lo is therefore respectfully requested.

CONCLUSION

Having responded to all objections and rejections set forth in the outstanding Office Action, it is submitted that claims 1-90 are in condition for allowance and Notice to that effect is respectfully solicited. In the event that the Examiner is of the opinion that a brief telephone or personal interview will facilitate allowance of one or more of the above claims, he is courteously requested to contact applicant's undersigned representative.

Respectfully submitted,

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